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Native iron in Quaternary deposits of the Darhad Basin (*northern Mongolia*)

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Abstract

Quaternary sediments from the borehole DBC-1 drilled in the Darhad Basin, northern Mongolia, have been studied by thermomagnetic analysis (248 samples) and probe microanalysis (9 samples) to determine the origin (cosmic or terrestrial) of native iron. Most of the samples showed extremely low contents of native iron. Only 26 samples have iron in contents sufficient for its reliable identification (10^{-5}–10^{-3}%). The negligible content of native iron in the Darhad Basin sediments distinguishes them from the earlier studied sediments of different geologic associations of Eurasia and the Atlantic, which we explain by the high sedimentation rate in this basin. However, the bimodal distribution of native-iron contents in the samples with a distinct "zero" mode, similar to that in the objects of Eurasia and the Atlantic, testifies to the predominantly cosmic origin of the native iron.

Keywords: native iron; magnetic minerals; thermomagnetic analysis; probe microanalysis; Quaternary deposits; Darhad Basin

Introduction

Particles of native iron are often found in sedimentary rocks. Native iron in deep-water ocean sediments and manganese concretions is usually considered to be of cosmic origin (Brownlee, 1985; Fredriksson and Martin, 1963; Murray and Renard, 1891; Parkin et al., 1980). However, many sediments contain iron particles related to volcanic activity, bacterial activity, and metamorphism (Frost, 1985; Lukin, 2006; Novgorodova, 1994; Shterenberg and Vasil'eva, 1979). Therefore, it is important to find signs of difference between native iron of cosmic and terrestrial origin.

In recent years, we have studied the abundance and composition of native iron particles in epicontinental sediments of different ages (Miocene, Oligocene, Eocene, Cretaceous, Late Jurassic, and Early Cambrian) in different regions of Eurasia, in the Atlantic sediments, and in the Upper Miocene sediments of Lake Baikal (Grachev et al., 2009; Pechersky et al., 2008a,b, 2011, 2013a,b; Pechersky and Sharonova, 2012).

The content and composition of native iron particles were studied by thermomagnetic analysis (TMA) with heating to 800 °C and by probe microanalysis (PMA). The goal of this work was to perform TMA and PMA of such particles in the lacustrine sediments of the Darhad Basin, northern Mongolia (Fig. 1), in order to find signs of their cosmic or terrestrial origin.

The object of study

The highland Darhad Basin is located in northern Mongolia, in the southwest of the Baikal Rift Zone (Fig. 1). In contrast to nearby deep-water Lake Baikal and Lake Hövsgöl, the Darhad Basin is totally filled with sediments up to 500 m in thickness (Zorin et al., 1989). This is due to the active removal of clastics from the surrounding mountains. Moreover, the Darhad Basin repeatedly became a lake as a result

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